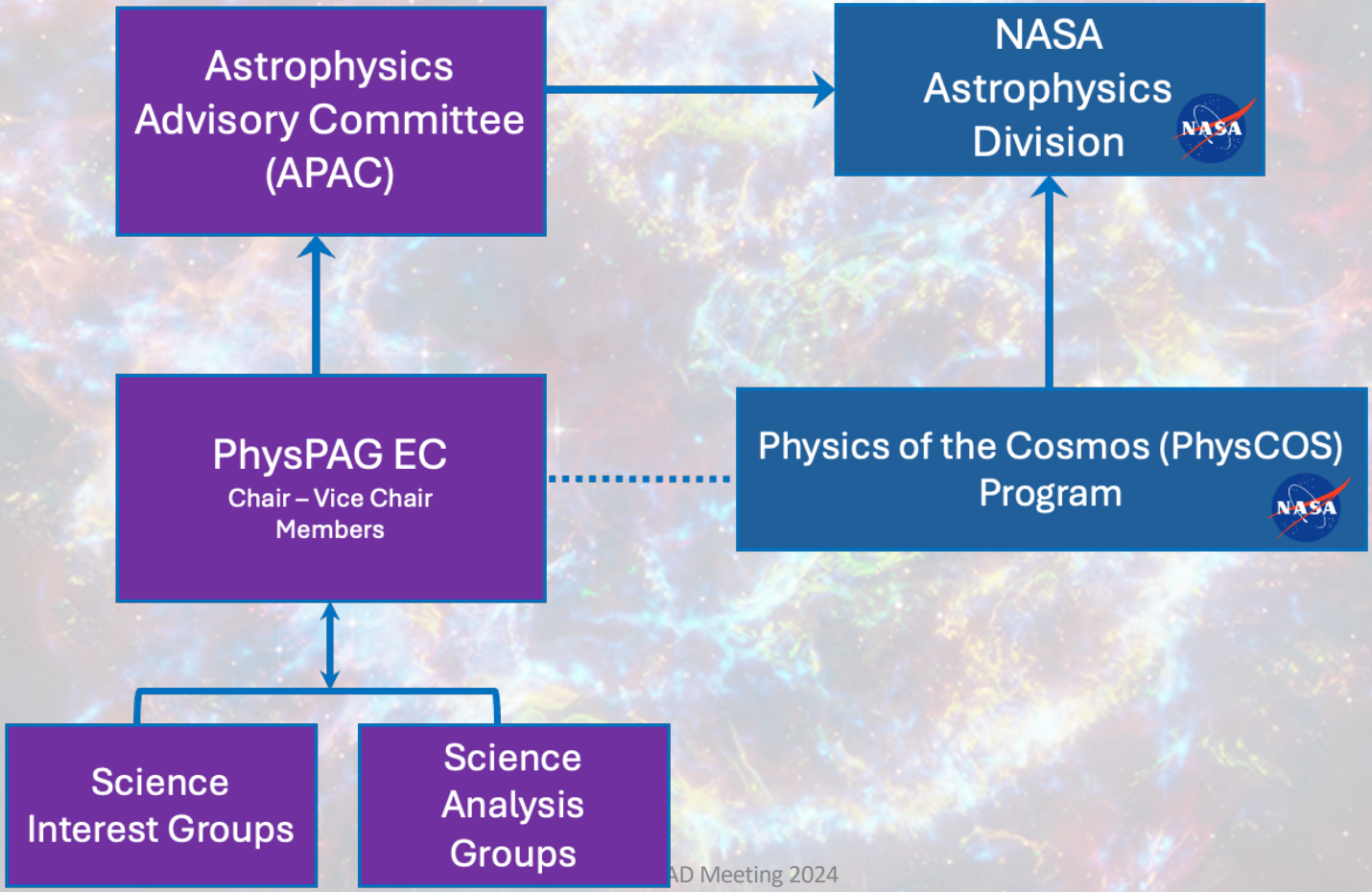
The Physics of the Cosmos Program Office

Francesca Civano and Brian Humensky

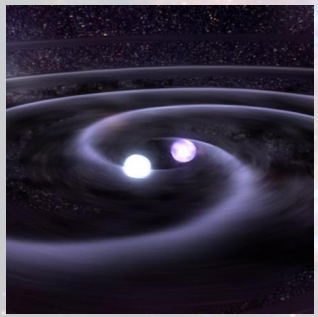
Chief Scientists, PhysCOS

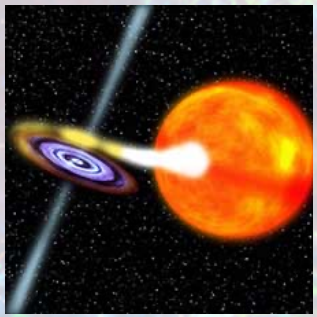
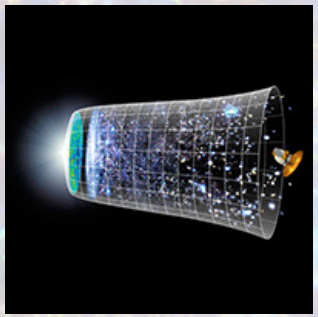
Phys… What?!?


Astrophysics Advisory Committee (APAC)
NASA Astrophysics Division
PhysPAG EC
Chair – Vice Chair
Members
Physics of the Cosmos (PhysCOS) Program
Science Interest Groups
Science Analysis Groups

The PhysCOS Program Office

Physics of the Cosmos spans the fields of high-energy astrophysics, cosmology, and fundamental physics, to explore some of the most fundamental questions regarding the physical forces and laws of the universe:




- Manages strategic technology development
- Provides a two-way communication conduit between community & NASA
- Works with sibling program offices: **Cosmic Origins** and **Exoplanet Exploration**

NASA Physics of the Cosmos (PhysCOS) and Cosmic Origins (COR) Programs

Program Management
Program Manager: Barbara Grofic
Deputy Program Manager: Cathy Barclay
Program Business Manager: Tracy Felton-Robinson
Administrative Assistant: Susan Wright

Procurement Support:
Space Science Procurement Manager: Malika Graham

Program Support
IPTL: Patricia Butler* *PSM*: Mary Dobay*

Resources Management Group
Deputy Program Business Manager: Patricia Smith
Programmatic Officer: Patricia Butler*
RA's: Jessie Hughes*, Ryan Bradley*

Strategic Studies & Implementation

Program Science
PhysCOS Chief Scientists: Dr. Francesca Civano, Dr. Brian Humensky
COR Chief Scientist: Dr. Peter Kurczynski
Deputy COR Scientist: Dr. Swara Ravindranath*[1]
PhysCOS/COR Science PSM: Stephanie Clark*

Program Technology & Systems Engineering
Program Systems Engineer: Dr. Mark Matsumura^
Technology Development Manager: Rachel Rivera
Chief Technologist: Jason Derleth[2]
Program Technologist: Dr. Opher Ganel*

Fornax Initiative
Initiative Manager: Patrick Coronado*
Lead Scientist: Dr. Tess Jaffe
Deputy Scientist: Dr. Francesca Civano

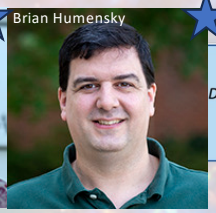
TDAMM ACROSS Initiative
Initiative Manager: Dr. Chris Roberts
Study Scientist: Dr. Brian Humensky
Systems Engineer: Dr. Mark Matsumura

LISA Study
Study Manager: Terry Doiron
Study Scientist: Dr. Ira Thorpe
System Engineer: Norman Rioux^

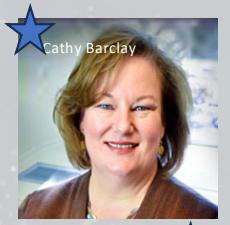
ATHENA Study
Study Manger: Dr. Mark Matsumura (Acting)
Study Scientist: Andy Ptak
Deputy Study Scientist: Kristin Madsen
Systems Engineer: Robert Studer*

ULTRASAT MOU Implementation
Initiative Manager: Barbara Grofic
Deputy Initiative Manager: Cathy Barclay
Initiative Scientist: Dr. James Rhoads
System Engineer: Dr. Mark Matsumura


Francesca Civano


Brian Humensky

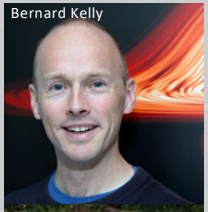

Barbara Grofic

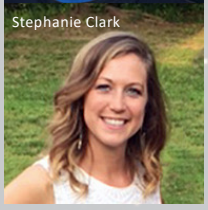

Cathy Barclay


Mark Matsumura


Rachel Rivera


Jason Derleth


Bernard Kelly


Stephanie Clark


Valerie Connaughton

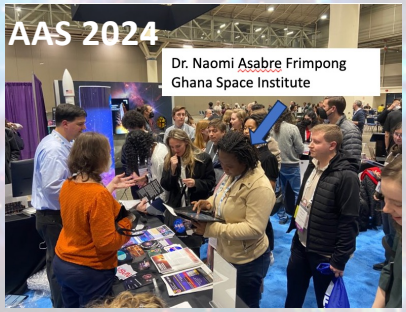

Sanaz Vahadinia

HQ Program Executive: Shahid Habib
HQ Program Scientist: Valerie Connaughton
HQ Dep. Program Scientist: Sanaz Vahadinia

*Contractor
^Independent Technical Authority
Habitable Worlds Observatory/GOMAP
[1] START Member (Ex-Officio)
[2] TAG Member (Ex-Officio)

PhysCOS Program Office Activities

- The program office supports the community by
  - Facilitating the PhysCOS Program Analysis Group (PhysPAG);
  - Supporting the activities of Science Interest and Analysis Groups (SIGs and SAGs)
  - Informing members of upcoming funding and engagement opportunities;
  - Soliciting community-identified science and technology gaps;
  - Managing funded technology projects with benefits to PhysCOS science;
  - Maintaining science cognizance to enable more successful NASA strategic planning;
  - Community engagement: AAS, HEAD, APS, SACNAS, NSBP, …
  - Supporting mission studies: LISA just went through adoption and NewAthena is returning to the PO.



PhysCOS Program Analysis Group Executive Committee

YEARLY call for new EC members:
PLEASE CONSIDER TO JOIN!

R. O'Brient – JPL

V. Miranda – Stony Brook

M. E

B. Gre
XR SIG

A. Corsi – TTU
GW SIG

D. Pooley – Trinity U.
XR SIG – Vice Chair

Stephanie Wissel - PSU
CR SIG

K. Madsen - GSFC
XR SIG

J. Finke - NRL
GR SIG & Chair Emeritus

J. Perkins - GSFC
GR SIG

E. Burns – LSU
TDAMM SIG

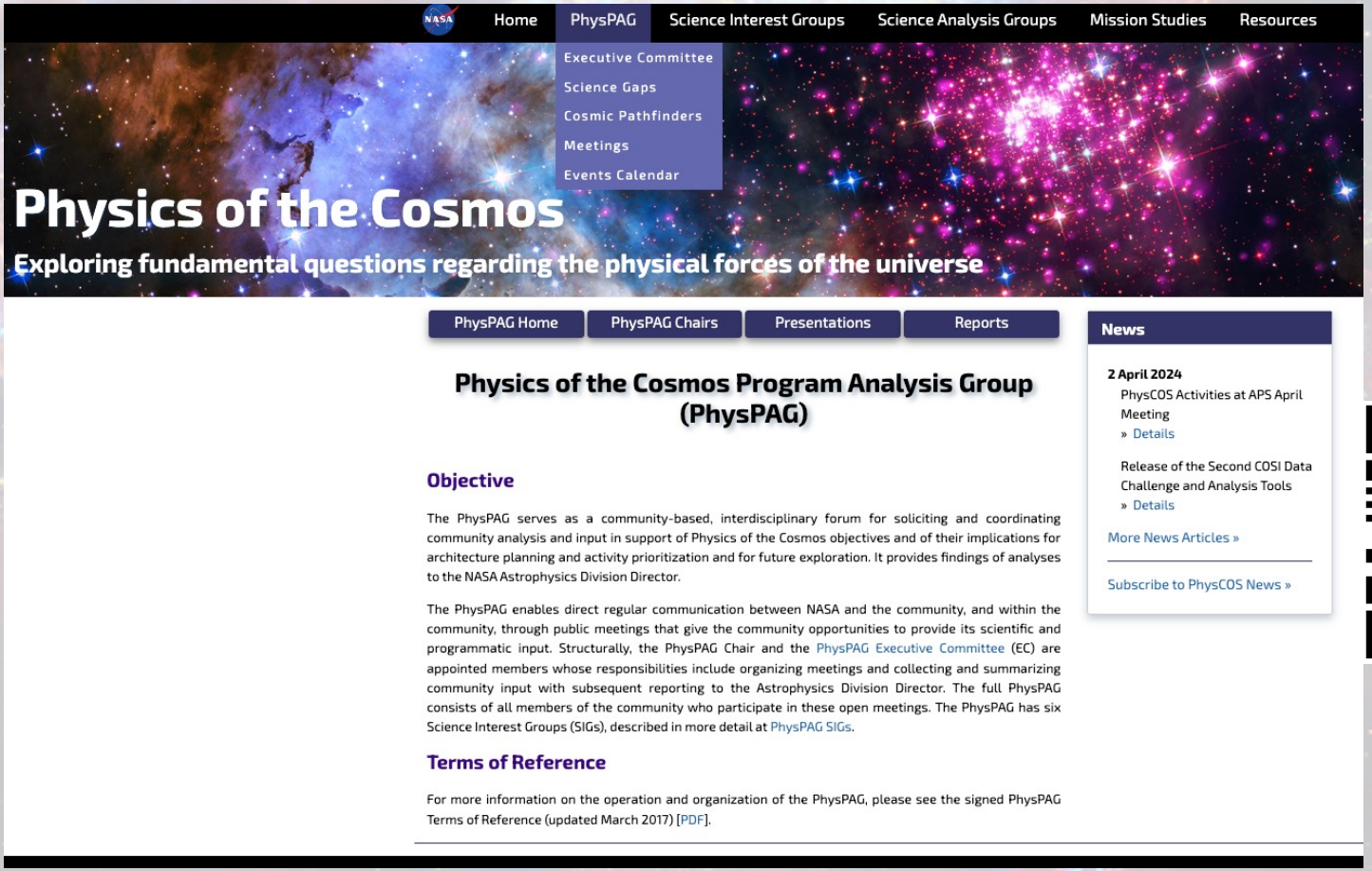
C-T. Chen - USRA
XR SIG

A. Meli – NC A&T
CR SIG & Chair

https://pcos.gsfc.nasa.gov

Site QR Code:

Mailing List QR Code:



https://pcos.gsfc.nasa.gov

Site QR Code:

Science Interest Groups | Science Analysis Groups

Science Interest Groups (SIGs)

Science Interest Groups (SIGs) are standing groups of scientists with interests in a certain area of astrophysics. SIGs provide quantitative metrics and assessments to NASA in regard to current and future needs of the community in that area, and act as a focal point and forum for the community.

Most SIGs operate within one of the three themes of NASA Astrophysics — Physics of the Cosmos, Cosmic Origins, and Exoplanet Exploration — but some encompass all astrophysics themes.

All PhysCOS SIGs are chaired by one or more members of the PhysPAG Executive Committee. Anyone subscribed to a SIG's mailing list is considered a member of the SIG.

Current SIGs

- Cosmic Ray (CR SIG) (Chairs: Andrew Romero-Wolf and Athina Meli): Coordinate community activities and preparations for a future cosmic ray astronomy mission.
- Cosmic Structure (CoS SIG) (Chairs: Vera Gluscevic and Rebekah Hounsell): Coordinate community activities for future space activities concerning the nature of dark energy, dark matter, neutrinos, and tests of inflation, as well as astrophysical galaxy evolution.
- Gamma Ray (GR SIG) (Chairs: Justin Finke, Eric Burns, and Manel Errando): Coordinate community activities and preparations for a future gamma ray astronomy mission.
- Gravitational Wave (GW SIG) (Chairs: Chiara Mingarelli and Alessandra Corsi): Coordinate community activities and preparations for a future gravitational wave mission.
- Inflation Probe (IP SIG) (Chair: Roger O'Brient): Coordinate community activities and preparations for a future cosmic microwave background polarization mission.

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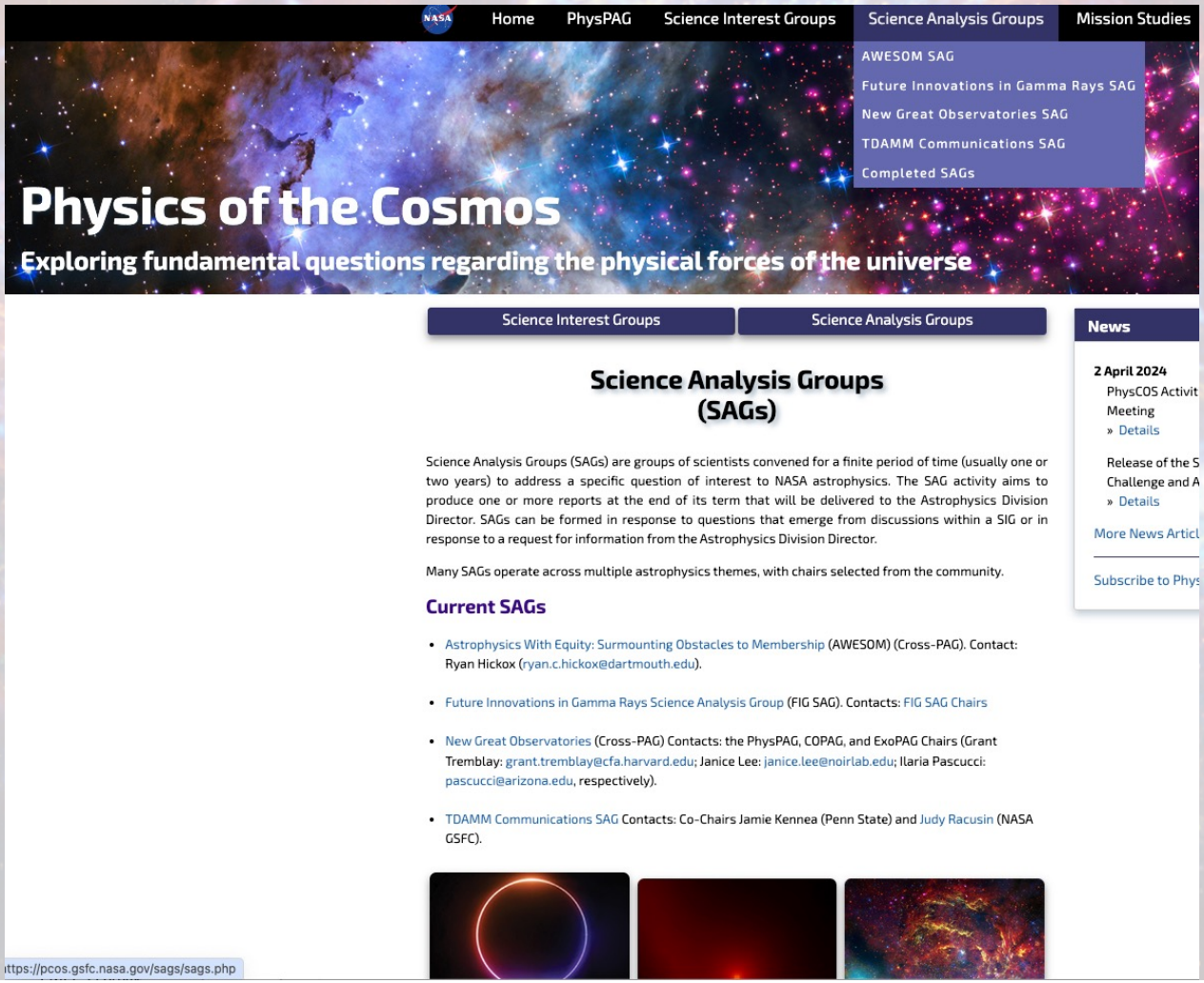
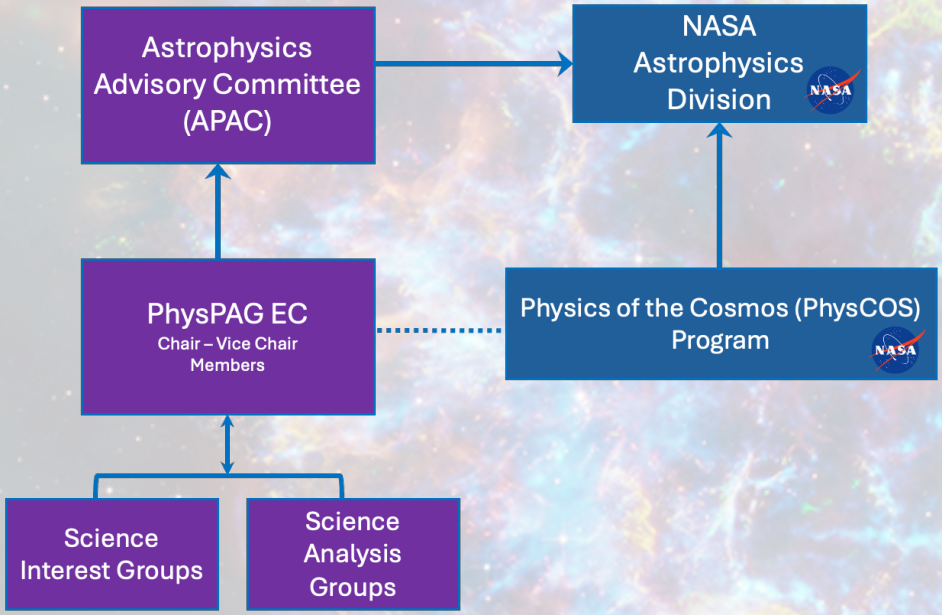


Science Interest Groups & Science Analysis Groups



- **Science Interest Groups** are community-led affinity groups focused on a particular area that are long-term.
  - Meet regularly to discuss science and technology developments, concerns in field
- **Science Analysis Groups** are stood up for a short term (1-2 years) to analyze a specific issue and deliver a report to APAC & Astrophysics Division.
  - Proposed by SIGs or requested by HQ
  - Membership open to any who are interested

Science Interest Groups & Science Analysis Groups

Science Interest Groups (SIGs) **Science Analysis Groups (SAGs)**

Cross-PAG

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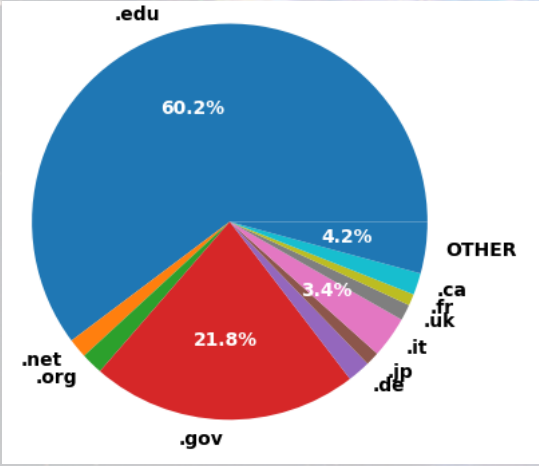
Interested in forming a new SAG? Let's talk!

Community Engagement

>30% INCREASE

SIG Subscribers	2023	2024
CR	78	138
CoS	71	169
GR	242	309
GW	396	514
IP	122	151
XR	189	268
TDAMM	15	119

Subscribers Analysis:



Are you in our list?
Are you in a SIG?
Please join as we need your inputs!

Mailing List QR Code:

Strategic Technology Development

The Program Office

- Monitors and manages PhysCOS and COR Strategic Astrophysics Technology (SAT), Internal Scientist Funding Model (ISFM), Roman Technology Fellowships (RTF) and other direct-funded technologies;
- Focuses on Astro2020-related technology development (FGOs, Probes); and
- Conducts Technological Readiness Level (TRL) assessments.

- PhysCOS/COR Technology Website https://apd440.gsfc.nasa.gov/technology.html
  - Program Overview, Tech Gaps, Technology Photo Gallery, Publications
- AstroTech Database http://www.AstroStrategicTech.us/
  - Published PI Annual Reports 2023
- Astrophysics Biennial Technology Report (ABTR) 2022 & Astrophysics Technology Update (ATU)
  - Plan to publish 2024 ATU by July and 2024 ABTR and by September

Technology Gaps Call

- Biennial strategic technology gap prioritization process to ensure that APD invests in the right technologies.
- Reaching out to the community to help identify gaps between today's state-of-the-art technologies and what will be needed for missions & development activities prioritized by Astro2020.
- Details at https://pcos.gsfc.nasa.gov/news/2024/6_Technology_Gaps_Submissions_Due.php
  - Public webinar planned for May 14th
- Tech gaps submissions are due by June 3rd – please submit to ensure that technologies needed for PhysCOS science are well covered
- PhysPAG EC will assist in reviewing gap submissions
  - Merging similar gap submissions, updating previous gaps, editing text
  - Then hand off to the Program Office for prioritizing into tiers

Compiling Science Gaps

GOAL: produce a list of precursor and preparatory science gaps for PhysCOS-related science as a resource for the community

- Precursor Science informs the mission architecture and trades
  - Needed soon for HWO and over coming years for X-ray/FIR future great observatories
  - Looking for natural gaps, thresholds, and gradients in the science return vs. measurement parameters
- Preparatory Science informs data / interpretation or early operations; potentially from new observations, but needed just before or soon after launch to help inform the best way to conduct investigation
- Started a process similar to the Technology Gaps process:
  - Science Gaps site with link to google form for submissions
  - Next steps: (1) review and iteration by SIGs and program office; (2) review by HQ; (3) Publish the list on PhysCOS website; (4) annually/biennially update the list

Precursor Science Gaps

- Collected community inputs on Precursor Science Gaps for HWO and FGO X-ray and IR for Precursor Science 2024 ROSES call
- 30 gaps: 15 about HWO, 5 FIR and 10 X-ray
- X-ray SIG chairs and X-ray community involved: three gaps in 2023 to ten gaps in 2024!

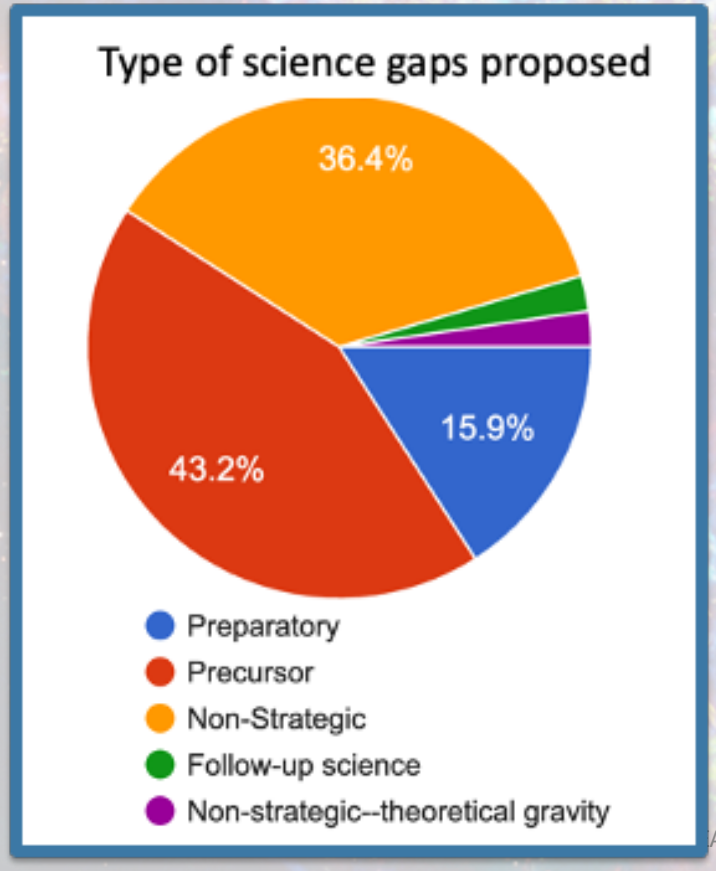
X-ray Precursor Science Gaps

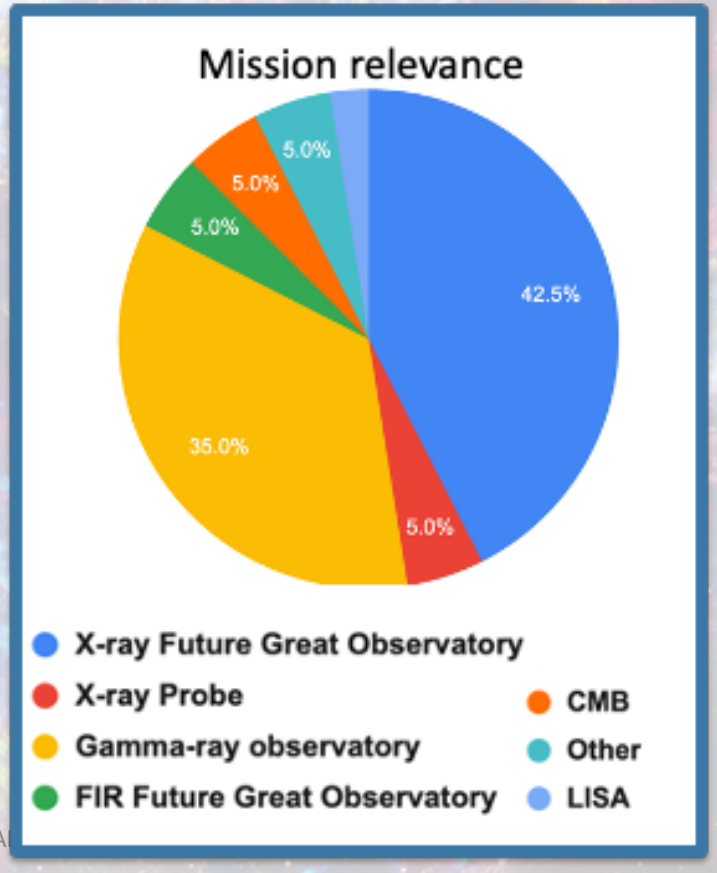
1. Black holes at the cosmic dawn: expectations for the early SMBH populations
2. Improved understanding of the relation between X-ray Binary emission, galaxy properties, and theoretical predictions
3. Probe the corona emission in Active Galactic Nuclei at hard X-ray energies
4. Theoretical modeling of High Redshift Gamma-ray Bursts
5. Blazars across cosmic time: evolution of jetted AGN and theoretical interpretation
6. Multi-messenger observations of extreme supermassive black holes
7. Understanding SMBH growth across cosmic time using black hole spin
8. Improving the Understanding of Jet Launching Regions in Astrophysical Sources
9. Modeling Feedback in Galaxy Evolution to better understand impact of magnetic fields and outflows
10. Atomic Data Needs for High-Resolution X-ray Spectroscopy

Gaps are listed here:

Community inputs* on Science Gaps

*As of March 2024





The Habitable Worlds Observatory

- NASA's next flagship mission concept recommended by Astro2020 Decadal Survey
- First telescope designed specifically to search for signs of life on planets outside our solar system
- HWO is perceived as an exoplanet GO but it will also conduct a **transformative** general Astrophysics program
- START an

What are the transformative astrophysics questions relevant to PhysCOS that HWO can address?

Scienc

- Quant
- Outlin
- Develo
- Assess the fidelity of models needed in the future to execute future trades.

See Eric Burns Talk

Technical Assessment Group (TAG)

- Study architecture options.
- Identify and assess the mission architectures and technologies needed to enable those options.
- Evaluate the risks associated with those options.

Adapted from J. O'Meara AAS presentation

Commitment to Diversity, Equity and Inclusion

Cosmic Pathfinders Program

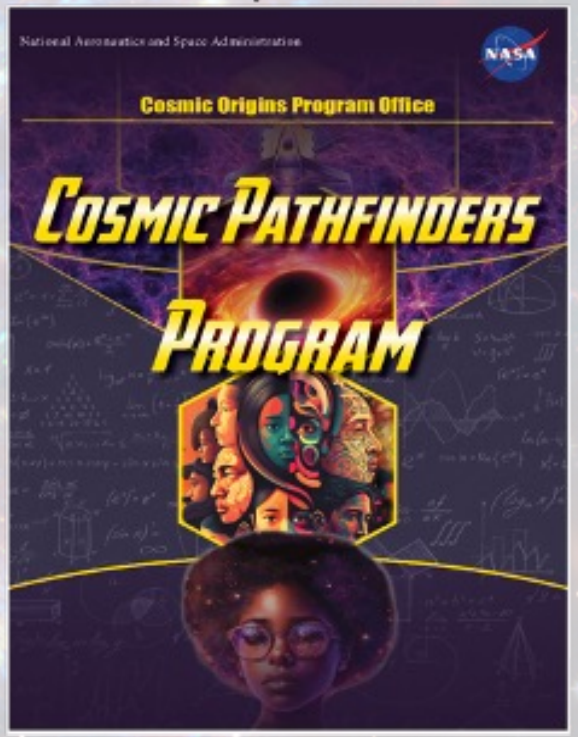
Directed by Ronald Gamble, NASA/GSFC/UMCP

Current student leadership includes:

- **Amethyst Barnes (NASA GSFC/CRESST-II Post-Bac, Roman/STScI)**
- **Jordan Forman (NASA GSFC/CRESST-II Post-Bac, FERMI)**
- **Gokul Srinivasaragavan (Doctoral Candidate, UMCP Department of Astronomy)**
- **Isiah Holt (NASA Pathways Intern & Doctoral Candidate, UMCP Department of Astronomy)**

- **Cosmic Chatter**
  - **Career Roadmap Discussion — Career pathways for Missions**
  - **Science Communication Panel — Communication**
  - **(~12) Student Presentations [March - June] — Engagement**
- **Hack-a-thons**
  - **JWST, XRISM, COSI…Roman (?), HWO (?), LISA (?) , along with the potential to extend to many others.**
- **Professional Societies/ Conference Participation & Sessions**
  - **AAS, APS, NSBP, SACNAS, NSBE, SPIE, Great Minds in STEM**
- **University Chapters**

Current student membership across the Cosmic Pathfinders footprint has eclipsed ~500 students & Early-Careers



Support Conferences: 3rd TDAMM Workshop

Big Questions:

- What are the most important multidisciplinary questions of interest for TDAMM Astrophysics?
- What are the key measurements? How can we leverage current and forthcoming facilities? Do we need new ones?
- For astrophysical observations, are additional coordination recommendations needed beyond those in the second time-domain and multimessenger white paper?
- What advances are relevant for other fields of physics and national strategic priorities?
- How can multidisciplinary research be fostered?

Join our mailing list and SIG and SAG

Mailing List
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